Getting Started with the Green Hills Probe

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DISCLAIMER

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Chapter 1

Installing Your Probe

Contents

About This Book

This book explains how to install and configure your probe. You will learn how to:

- Connect your probe to your hardware and host machine
- Configure your probe for use with your hardware and MULTI
- Create and build a project for an example program
- Download the program to your hardware and debug it

For reference information, detailed information about commands and options, and advanced topics, see the *Green Hills Debug Probes User's Guide*.

Requirements

Before installing and configuring your Green Hills Probe, you must install MULTI and the Green Hills Compiler for each architecture that you plan to use. If you have not installed MULTI yet, do so now. For information about installing MULTI, see the installation document located in the root directory of the installation CD. The instructions in this guide cover installation with MULTI 6. If you are using another version, some instructions may differ.

Terms You Should Know

- **Host** — The computer on which you are running MULTI.
- **Target** — The hardware for which you are developing programs.
- **Target Adapter** — An adapter that connects your probe to your target. Target adapters can connect both debug and trace signals to a debug probe, and are used by both Green Hills Probe and SuperTrace Probe.
- **Target Transition Module (TTM)** — A simple target adapter that connects to the probe's **Target Interface** port, for use with a ribbon cable.

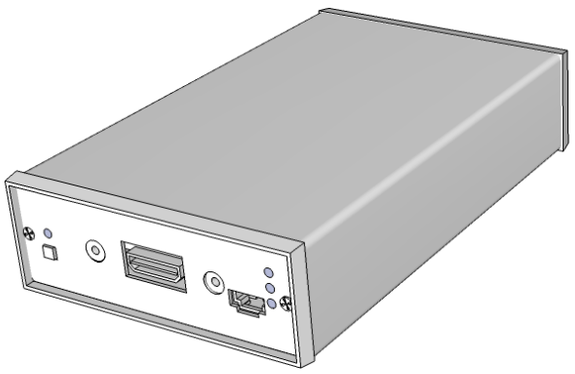
- **Active Pod** — A powered target adapter and cable that connects the probe's **Target Interface** port to the debug port on your target. The active pod has both a plug and socket, either of which can be used to connect to your target's debug port. The socket will require an extension cable, and can be useful when the plug does not fit due to board clearance. The active pod always connects to the probe via a TTM that is marked `DB-EXTEND`.
- **TraceEverywhere (TE)** — The Green Hills interface for trace port adapters that carry trace and debugging signals. TE trace adapters adapt a specific target trace port to TE so that the SuperTrace Probe can trace different targets by just changing the TE trace adapter. The Green Hills Probe also uses TE trace adapters to connect to various debugging ports, such as Nexus, ARM CoreSight, and other JTAG-based ports.

When You Encounter Problems

If at any time you receive an error or are unable to continue, see Appendix A, “Troubleshooting” on page 39. For more information about any of the options or procedures described in this book, see the *Green Hills Debug Probes User's Guide*.

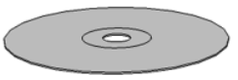
Verifying Components

The box for your Green Hills Probe should contain the following items:

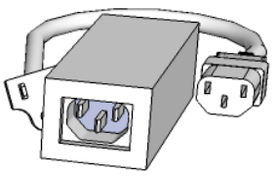


Green Hills Probe

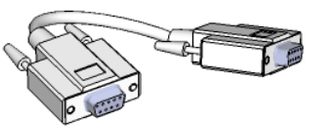
Screwdriver



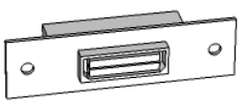
Green Hills Probe CD



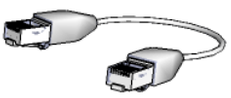
Power supply



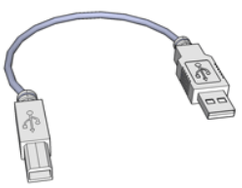
Serial cable



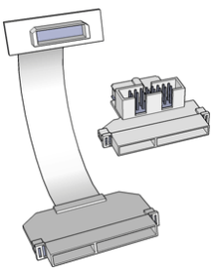
TTM*



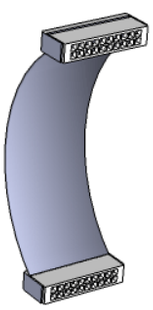
Ethernet cable



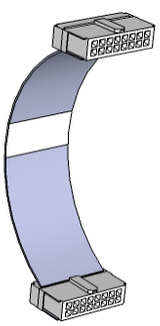
USB cable



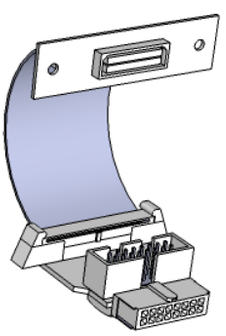
TE target adapter ‡



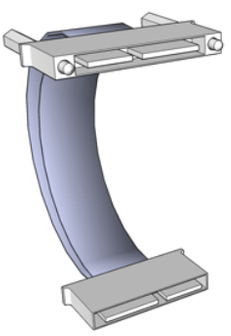
Ribbon cable ‡



Shielded COP cable (JTAG COP targets) ‡



Active pod (JTAG COP and ColdFire targets) ‡



TE cable ‡

* Your box might contain multiple TTMs. If it contains a single TTM, the TTM and ribbon cable may already be attached to the probe.

‡ Your box either contains legacy cabling (ribbon cables and active pods) or TE cabling. TE target adapters vary by target.

Installing Green Hills Probe Software

Before using your Green Hills Probe with MULTI, you must install the software on the Green Hills Probe CD. The software on the CD includes:

- USB drivers (Windows only).
- Probe firmware for the release marked on the CD. This firmware is installed in ***install_directory*/ghprobe**.
- **Project Wizard** files that add support for new boards.
- Documentation, as PDF files and in the MULTI help viewer.

To install the software, follow the instructions provided for your operating system:

Windows

1. Log in to Windows using an account with administrative privileges. Close MULTI and any other Green Hills Software applications. Make sure that the probe is not connected to your host machine.
2. Insert the Green Hills Probe CD for your target into the CD-ROM drive of your host machine. If the installation program does not start automatically, run **ginstall_win32.exe**.
3. The installer will suggest an installation directory. If this is the directory you would like to install to, click the **Easy Install** button; otherwise, click **Advanced Install** to specify an installation directory. The probe should be installed in the directory where the Green Hills Compiler is located (for example, **C:\ghs\comp_201354**). If you are using MULTI 5 or older, specify the directory where MULTI is installed.

Linux or Solaris

1. Close MULTI and any other Green Hills Software applications.
2. Insert the Green Hills Probe CD for your target into the CD-ROM drive of your host machine. If the installation program does not start automatically, run one of the following programs, depending on your operating system:
   - **ginstall_solaris2**

- **ginstall_linux86**

3. The installer will suggest an installation directory. If this is the directory you would like to install to, click the **Easy Install** button; otherwise, click **Advanced Install** to specify an installation directory. The probe should be installed in the directory where the Green Hills Compiler is located (for example, **/usr/ghs/comp_201354**). If you are using MULTI 5 or older, specify the directory where MULTI is installed.

Connecting Your Probe to Your Target

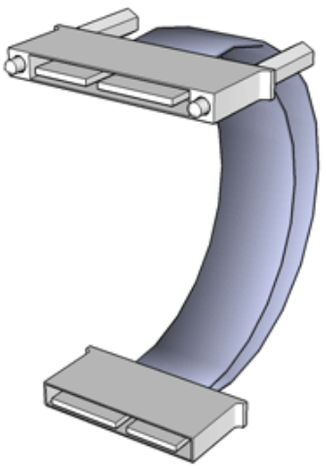
After checking the contents of the box and installing the necessary software, you are ready to set up your Green Hills Probe. This section explains how to connect the probe to your target using current cabling systems.

Determining Your Cabling System

Your Green Hills Probe comes with one of two different cabling systems:

- TraceEverywhere (TE) — supported on Green Hills Probe v3 with firmware 3.8.0 and higher.
- Legacy cabling — supported on all probes.

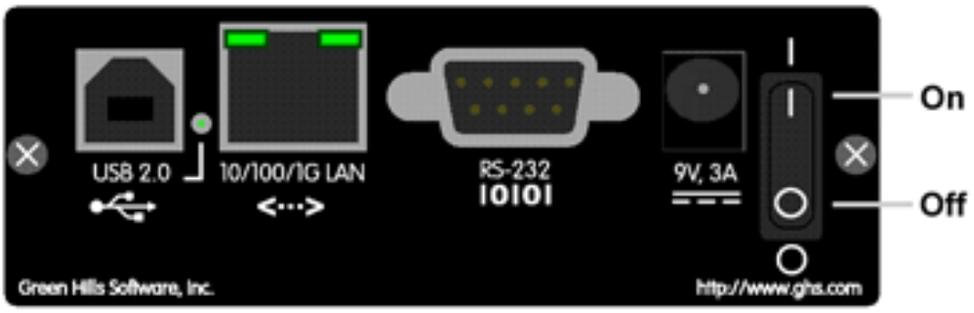
To determine which cabling system you have, check your box for a TE cable:



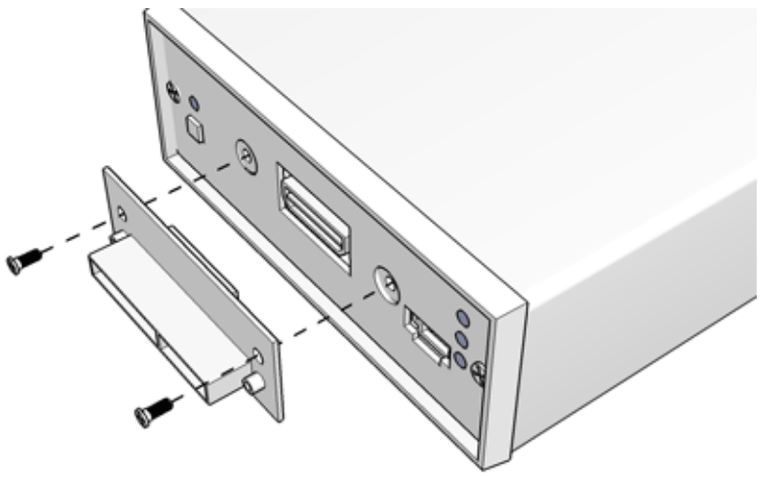
- If you have a TE cable, continue to “Connecting with TraceEverywhere” on page 9.
- If you do not, skip to “Connecting with Legacy Cables” on page 10.

Connecting with TraceEverywhere

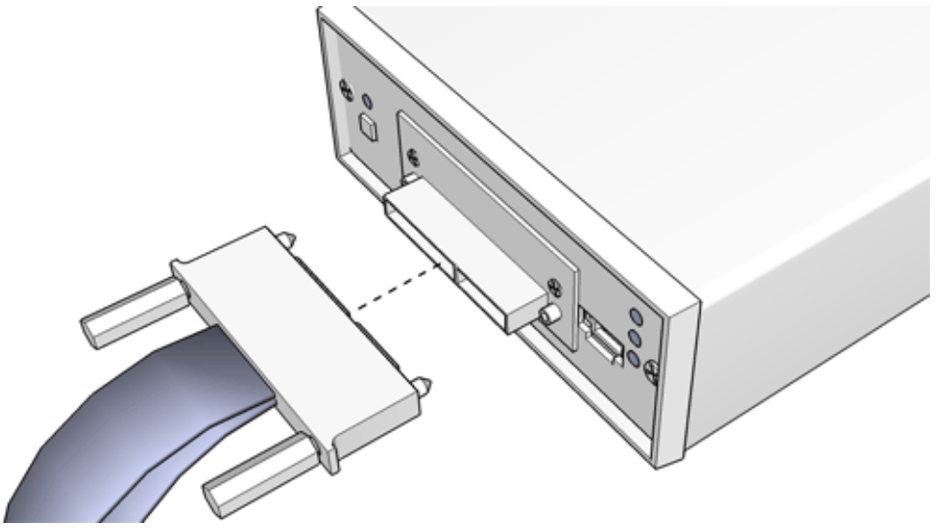
1. Before continuing, make sure that the power switch on the back of the probe is in the off (○) position.



2. If your probe already has the TraceEverywhere (TE) cable attached, skip to step 3. Otherwise, if there are screws in the holes on either side of the **Target Interface** port, remove them. Attach the target transition module (TTM) to your probe, using the screws to fasten it in place:



3. Attach the TE cable to the TTM:

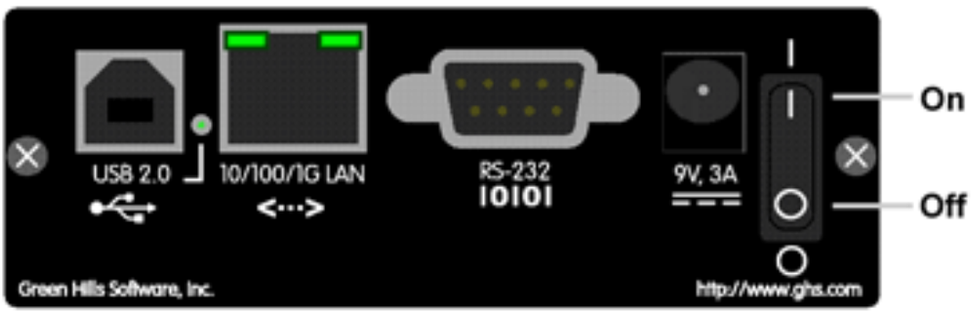


4. Attach the cable to the target adapter (this adapter varies by target board). If the adapter consists of multiple parts, do not disconnect those parts from one another; they are not designed to be plugged and unplugged several times.
5. Attach the target adapter to the debug header on your target board, being careful to orient the adapter correctly. If you are uncertain about the location of the debug header, refer to your target's reference manual.
6. Connect the power supply to the power input connector on the back of the probe and to an AC power outlet.

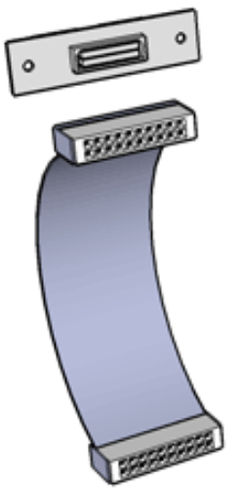
Your probe is now connected to your target and ready to connect to your host for configuration. Skip to “Connecting Your Host to Your Probe Over the Serial Port” on page 14.

Connecting with Legacy Cables

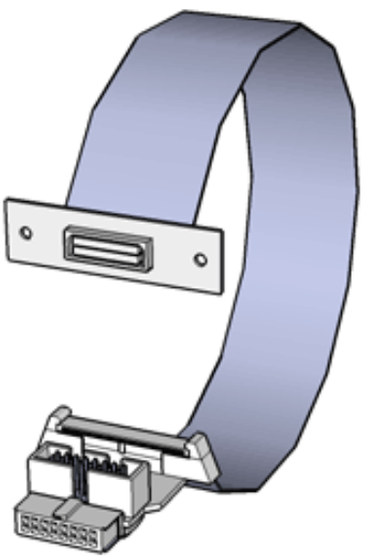
1. Before continuing, make sure that the power switch on the back of the probe is in the off (○) position.



2. If your probe already has a target adapter attached, skip to step 6. Otherwise, determine whether you will use a TTM and ribbon cable or an active pod to connect your probe to your target. If you could use either, the active pod has a longer cable, while the ribbon cable may be faster.

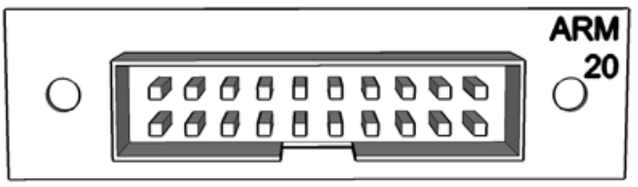


Ribbon cable and TTM

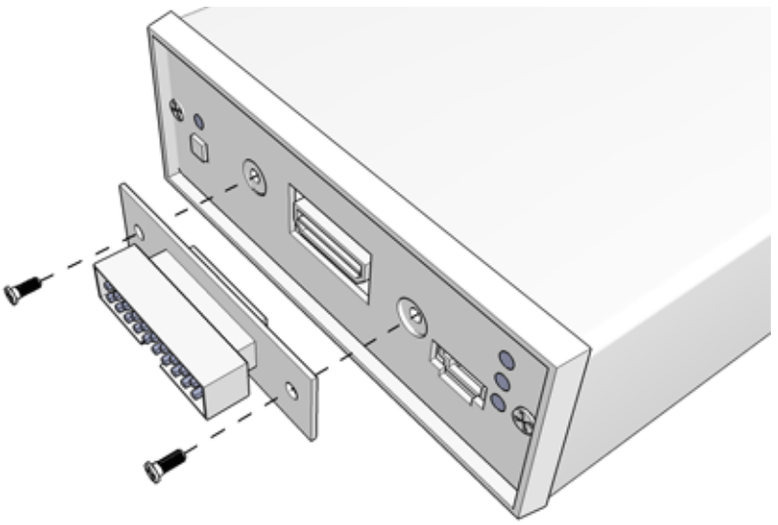


Active Pod

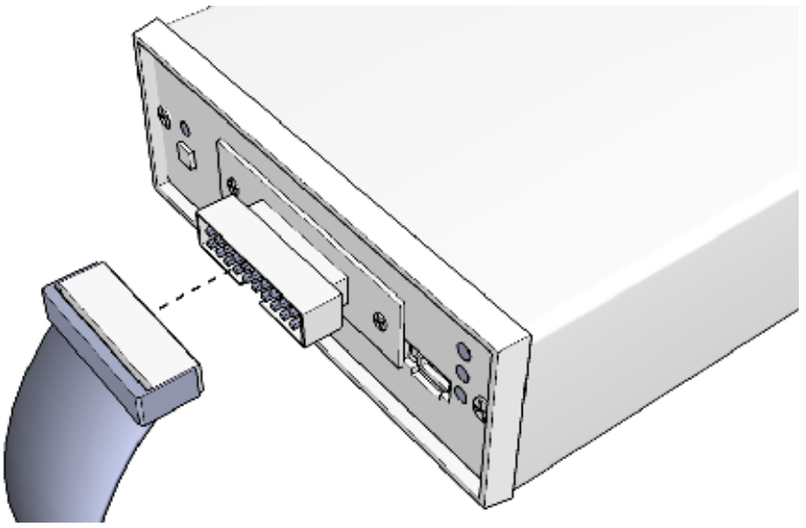
3. If you are using a ribbon cable and TTM, make sure that you are using the correct TTM for your target board. The type of adapter is printed on the upper-right corner of the target side of the module:



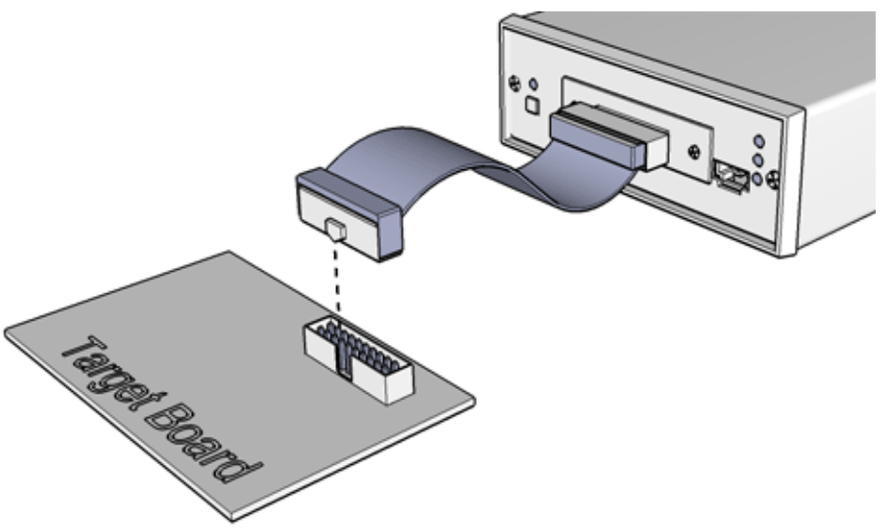
4. If your probe already has a target adapter attached, continue to the next step. If there are screws in the holes on either side of the **Target Interface** port, remove them. Attach the target transition module (TTM) to your probe, using the screws to fasten it in place (a TTM connection is illustrated below):



5. If you are connecting your probe to your target with a TTM and ribbon cable, connect one end of the supplied ribbon cable to the TTM.



6. Make sure that your target board is powered off, and connect the other end of the ribbon cable or active pod to the debug header on the target board, being careful to orient the cable correctly. If you are uncertain about the location of the debug header, refer to your target's reference manual.

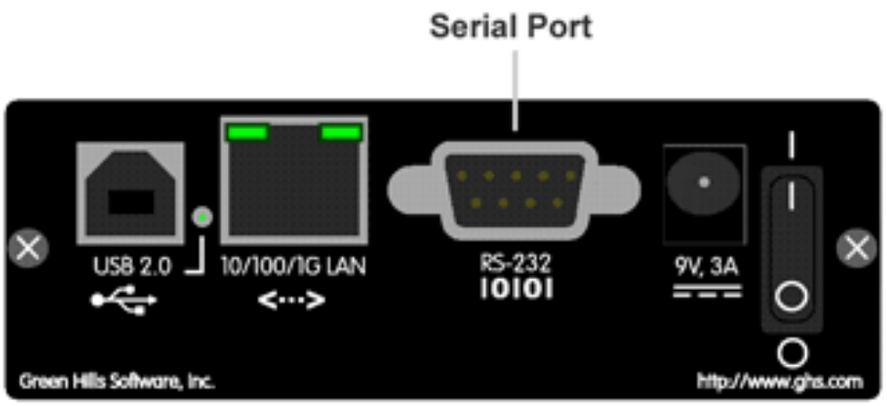


7. Connect the power supply to the power input connector on the back of the probe and to an AC power outlet.
8. Make sure to put your probe in a location that provides good airflow, where none of the vents are blocked.

Connecting Your Host to Your Probe Over the Serial Port

Now that you have connected your probe to your target, you can connect to the probe from your host machine over an RS-232 serial connection to confirm that it is operational. To establish a serial connection:

1. Connect a null modem cable to the serial port on the back of your probe and to a serial port on your host PC:



2. On your host machine, open a connection to your serial port with a serial terminal emulator (such as TeraTerm) using the following settings:
   - **Baud Rate** — 9600
   - **Data Bits** — 8
   - **Parity** — none
   - **Stop Bits** — 1
   - **Flow Control** — none
3. Set the probe's power switch to the on position (|).
4. If you see the following banner in the serial terminal, the serial connection was successful (the banner may vary depending on your firmware revision):

```
[?] % ghBootloader
Green Hills Probe, Version 3
Unit Serial Number 1337
Booting...

Probe Firmware Release Version 5.0.8
```

```
Module core built Tue Oct 29 18:40:23 2013
Serial No: 13030
Green Hills Probe v3
Part number 520-GP350-03x
Green Hills Software, Inc
http://www.ghs.com

    Serial: 9600
    USB: Enabled
    Ethernet: Enabled
    IP: DHCP
    Gateway: DHCP
    Netmask: DHCP
    MAC Addr: 00:12:5c:00:2d:e6

Starting the initialization sequence.
01234567 done.

Type 'info' to list probe information.
Type 'setup' to set the current configuration.
Type 'help' to list the online help.


[?] %
```

The prompt after the banner indicates that booting has finished, and displays both the target setting and state (`ppc5567` is provided as an example).

5. If you are using TraceEverywhere (TE) cabling, check for a green status light on the target adapter after the banner prints in the serial terminal. This light indicates that the adapter is plugged in and functioning correctly. If the light is red or off, see “TraceEverywhere Target Adapter Status Light Is Red or Off” on page 41.

Note

You may power on your target after it is plugged into to the probe and the probe is turned on, but you do not need to do so until you are ready to communicate with it.

Chapter 2

Configuring Your Probe

Contents

Your Green Hills probe is equipped with gigabit Ethernet and USB 2.0 ports for high-speed connections to your host computer. Although connecting to your probe through the serial port is a good way to confirm that it is operational, you must connect to your probe over Ethernet or USB to use it with MULTI.

- If you want to connect to your probe over Ethernet, see "Connecting to Your Probe Over Ethernet" on page 18
- If you want to connect to your probe over USB, see "Connecting to Your Probe Over USB" on page 24

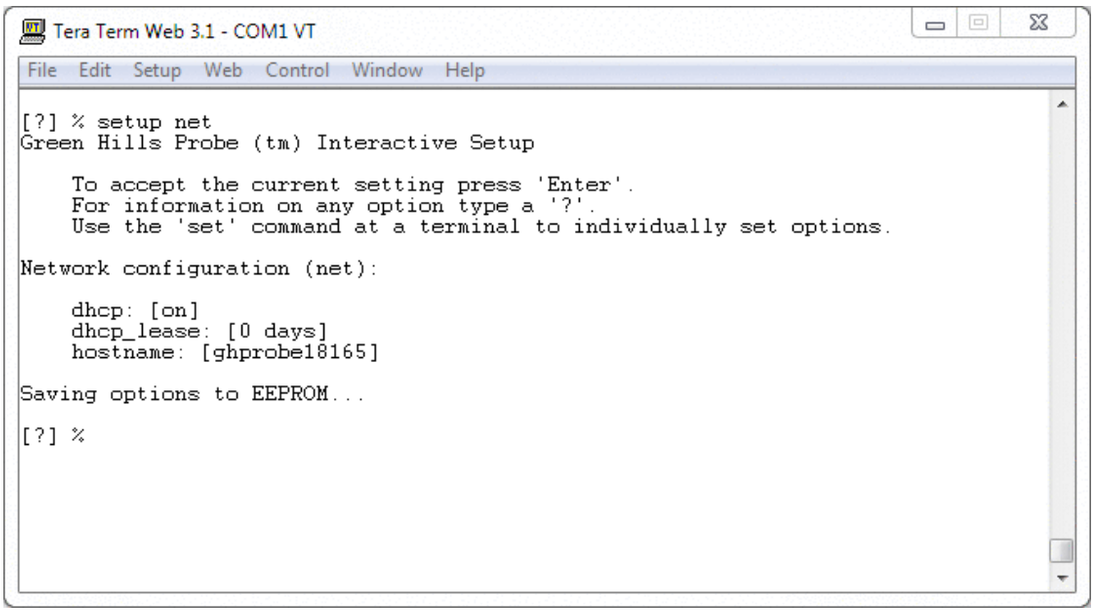
Connecting to Your Probe Over Ethernet

The probe can detect network settings automatically using DHCP. To connect your probe to a network using this feature, see "Configuring a Dynamic IP Address with DHCP" on page 19.

If your network does not support DHCP or you want your probe to use a static IP address, you can configure the settings manually using the instructions in "Configuring a Static IP Address" on page 20.

Configuring a Dynamic IP Address with DHCP

In the serial terminal window, type `setup net`. The probe presents the following settings with their default values.



1. `dhcp` — Press Enter to accept the default setting (`on`).
2. `dhcp_lease` — Press Enter to accept the default setting. This setting specifies number of days that the probe retains its DHCP settings. The default is `0`, meaning that the network settings never expire.
3. `hostname` — Type the hostname for your probe and press Enter. The DHCP server associates this hostname with your probe so that you can connect to your probe by specifying its hostname instead of its IP address. By default, the probe's hostname is `ghprobe`*`serial`*, where *serial* is your probe's serial number (for example, `ghprobe1234`). The probe's serial number is located on a sticker affixed to the bottom of the probe.

You have now configured your probe to obtain an IP address using DHCP. Skip to “Testing Your Probe's Ethernet Connection” on page 22.

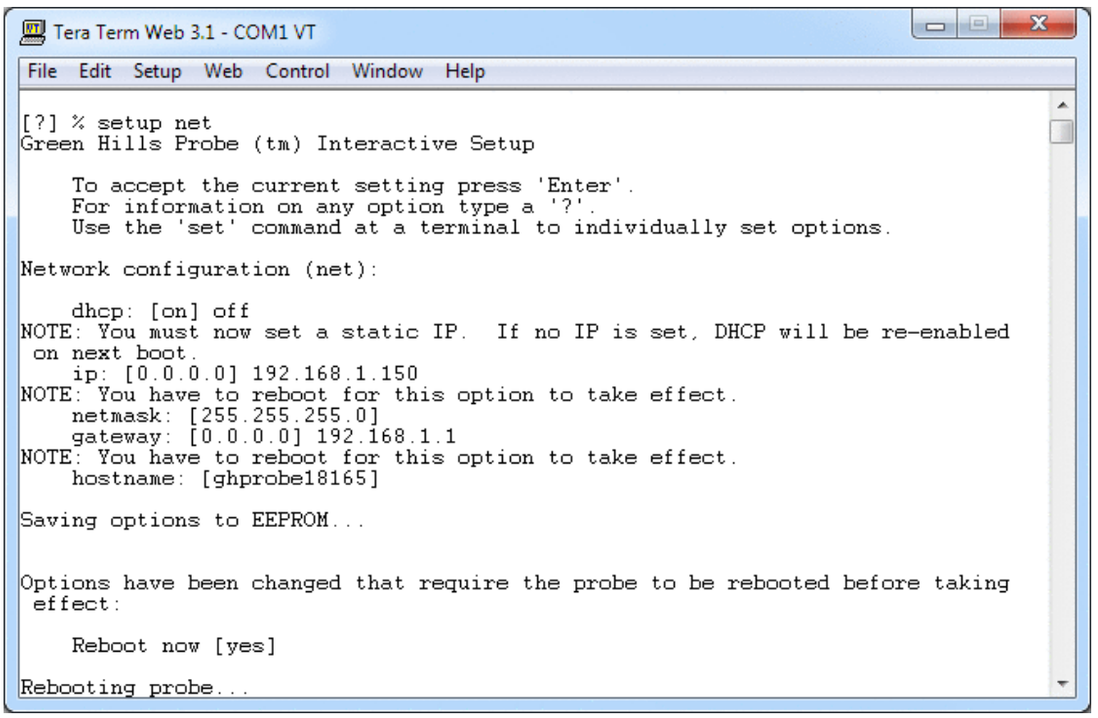
Configuring a Static IP Address

If you want to configure your probe to have a static IP address, you might need to contact your network administrator to obtain the following settings:

- IP address
- Gateway
- Netmask

If you set the IP address incorrectly, you could disrupt other devices on your network.

In the serial terminal window, type `setup net`. The probe presents the following settings with their default values.



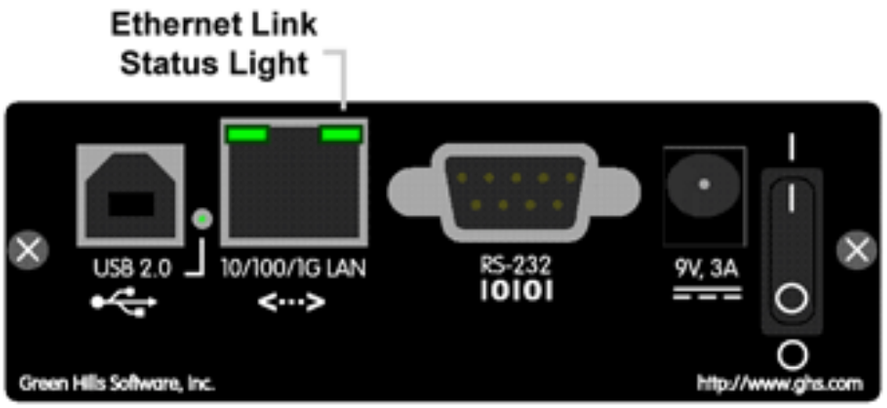
1. `dhcp` — Type `off` and press Enter.
2. `ip` — Type an IP address in dotted quad form and press Enter (for example, `192.168.1.150`).
3. `netmask` — Type the netmask in dotted quad form and press Enter. The default setting is appropriate for class C networks (most networks are class C). Use a different setting if you are not on a class C network.
4. `gateway` — Type the gateway's IP address in dotted quad form and press Enter.
5. `hostname` — Press enter to accept the default setting. This setting is not used when DHCP is off; it is provided for future protocol support. When transporting your probe between networks with and without DHCP, your probe retains its hostname.
6. When the probe asks if you want to reboot, press Enter to reboot the probe.

You have now configured your probe to use a static IP address.

Testing Your Probe's Ethernet Connection

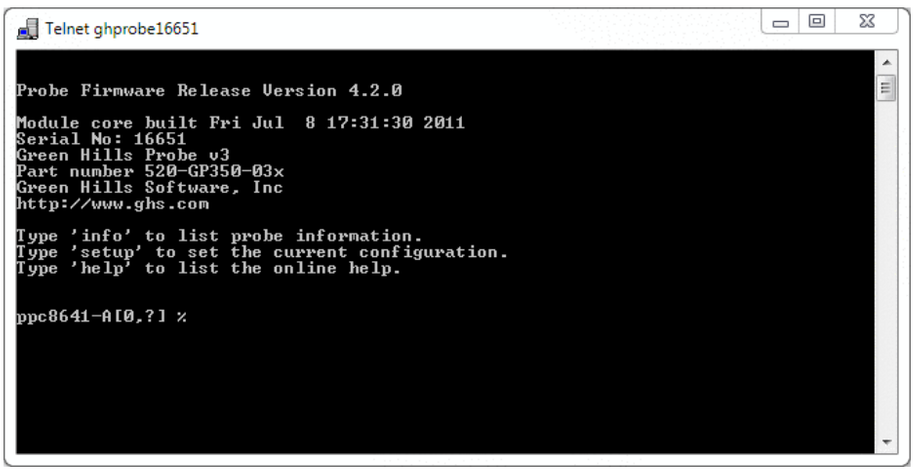
After configuring your probe for your network, test the Ethernet connection with Telnet. To connect to the probe through Telnet:

1. Plug one end of an Ethernet cable into your probe and the other end into a switch or hub that is attached to your network. If the probe detects that it is connected to a network, the Ethernet link status light turns on:



2. In the serial terminal window, type `reboot` to reboot your probe.
3. After your probe reboots, type `set ip` to confirm that your probe has an IP address.
4. If you are using Windows, select **Run** from the **Start** menu, type `telnet`, and click **OK**. If you are using Linux, open a shell and type `telnet`.

5. At the Telnet prompt, type `open ip_address`, where *ip_address* is your probe's IP address. If Telnet can connect to the probe, you should see the following screen:



Note

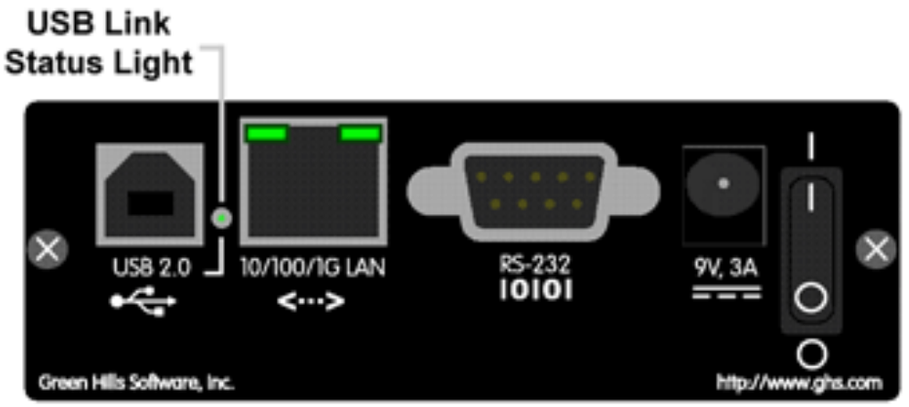
If you are using DHCP and your network supports dynamic hostnames, you can also open a connection with `open hostname`, where *hostname* is your probe's hostname.

You can now connect to your probe over Ethernet. Continue to “Connecting the Probe Administrator to Your Probe” on page 25.

Connecting to Your Probe Over USB

This section explains how to connect your probe to your host machine over USB. USB connections are supported on Windows only.

1. Connect a USB cable to the USB connector on the back of your probe and to a USB port on your host machine (or a USB hub connected to your host machine). The USB link status light should turn on:



2. If Windows reports that it has found a new USB device and asks to search for the appropriate drivers, click **Yes**. Windows will locate and use the driver you installed from the Green Hills Probe CD.

Note

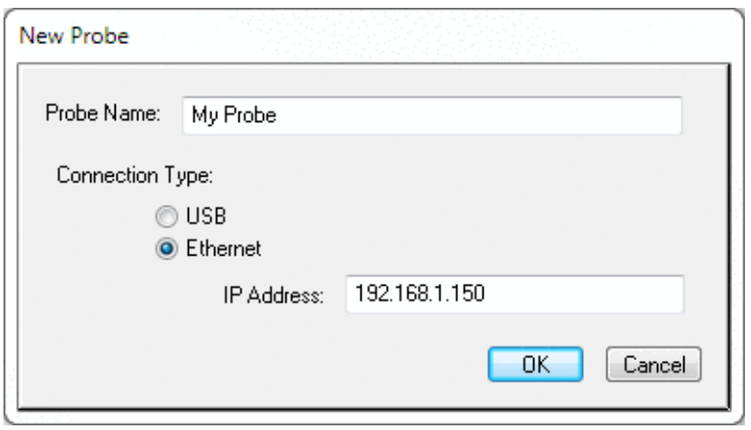
If Windows cannot find the driver and the **Install New Hardware Wizard** appears, run the installer on the Green Hills Probe CD. For more information, see “Installing Green Hills Probe Software” on page 5.

Connecting the Probe Administrator to Your Probe

Now that the probe can connect to MULTI, you can use MULTI's **Probe Administrator** to configure the probe for your target. The **Probe Administrator** is a program that lists all available probes and allows you to perform basic tasks such as setting options and updating firmware.

To connect to the **Probe Administrator**:

1. On your host machine, run MULTI.
2. In the MULTI Launcher, select **Utilities → Probe Administrator**.
3. In the **Probe Administrator**, select **File → New Probe** to open the **New Probe** dialog box.



4. In the **Probe Name** box, type a name for your probe that is easy to remember. This name is for your convenience only and is unrelated to the probe's hostname.
5. If you connected to your probe over USB, select the **USB** radio button. If you connected to your probe over Ethernet, select the **Ethernet** radio button and type your probe's IP address in the **IP Address** box.
6. Click **OK**.
7. In the **Probe Administrator**, double-click your probe's name to open a **Probe Administration** window. You are now connected to your probe with the **Probe Administrator**.

Detecting Your Target

The **Probe Administrator** contains a prompt that you can use to send commands to your probe. To use this prompt to configure your probe for your target board:

1. Power on your target.
2. In the **Probe Administration** window, click the **Prompt** tab.
3. At the prompt, type `detect`. This command configures the Green Hills Probe for the processors on your target board. It is useful even if the prompt indicates that the probe knows what target you are using, because it confirms that the probe is able to see your target and that the target is configured correctly. If the command prints the following message:

   `Target has been detected and set to` *`target_string`*

   where *target_string* is the name of your target, the detection was successful.
4. Type `save` to save the settings changed by **detect**.

If you have problems detecting your processors, see Appendix A, “Troubleshooting” on page 39.

Configuring Probe Options with a Configuration File

Green Hills provides probe configuration files for many different target boards. These files contain tested settings for all target-related configuration options. When you create a new project using MULTI 6.0 or later and Green Hills Probe v5.2 or later, a copy of this file will be added to your new project and will be automatically loaded when you connect MULTI to your target. If you have an earlier version of probe or MULTI software, you can find and load this configuration file manually. To determine if one of these files exists for your board, and to use that file to configure your probe:

1. In a terminal window or command prompt, navigate to your MULTI install directory for MULTI 5, or your tools install directory for MULTI 6 or newer. Inside that directory, navigate to **target*architecture***.
2. If there is a directory that is named after your board, navigate to that directory and look for a file that ends in **.cfg** or **.ghpcfg**. When you find the file, run one of the following commands:

   ```
   > tools_install\mpadmin -cfgload hostname config_file
   ```

   ```
   > tools_install\mpadmin -cfgload -usb config_file
   ```

   If there is no directory named after your board, or if the directory exists but it does not contain a configuration file, continue to the next section.

Running Diagnostics

Now that you have detected your target, run the following diagnostics to make sure that you can communicate with it:

1. Type `vb` to tests the bypass register of all devices on the JTAG scan chain. **vb** is not applicable for PowerPC 5xx, PowerPC 8xx and ColdFire targets. If you are using one of those targets, skip this step.
2. If your target has multiple cores, type `tl` (as in "target list") to obtain a list of cores and IDs. Then, type `t` *`core_id`* to select a core. Most subsequent commands, including the following diagnostics, control or configure just that core.
3. Type `tr` to reset your target. This command verifies that you can reset your target, and is necessary for some targets after testing bypass mode.
4. Type `rr` to confirm that the probe can read your target's registers. When successful, this command returns a list of registers, similar to the following output:

```
ppc5200[H] % rr
gpr0=0xac5658ad  gpr9=0x805000a0 gpr18=0x24444889 gpr27=0x04100821
gpr1=0x845008a1 gpr10=0x04400880 gpr19=0x8816102c gpr28=0x0446088c
gpr2=0x08421084 gpr11=0x04000801 gpr20=0x2c5058a0 gpr29=0x08101021
gpr3=0x24004800 gpr12=0x04020804 gpr21=0xa0404080 gpr30=0x2c425885
gpr4=0x8c001800 gpr13=0x08001001 gpr22=0x8c041808 gpr31=0xa0024005
gpr5=0x28005000 gpr14=0x2006400d gpr23=0x24144829    lr=0x00000000
gpr6=0xa0044008 gpr15=0x80120024 gpr24=0x885610ad   iar=0x00003ffc
gpr7=0x88141029 gpr16=0x00440089 gpr25=0x205240a4
gpr8=0x205640ac gpr17=0x08121024 gpr26=0x84440888
ppc5200[H] %
```

5. Type `vr 100` to test the probe's ability to write to registers and read back the values. This command runs the test 100 times.
6. Close the **Probe Administration** window. If you leave the window open, other applications may not be able to connect to your probe over USB.

If you are able to run all of the above commands without errors, your probe is able to communicate with your target and is ready for use with the MULTI Debugger. If any of the diagnostics fail, see Appendix A, "Troubleshooting" on page 39.

Chapter 3

Creating and Debugging a Program

Contents

Before beginning your first MULTI debugging session using your Green Hills Probe, you must ensure that your target board is configured properly. This section explains how to create a Top Project that you can use to configure your target, test your debugging environment, and download and debug a “Hello World” program.

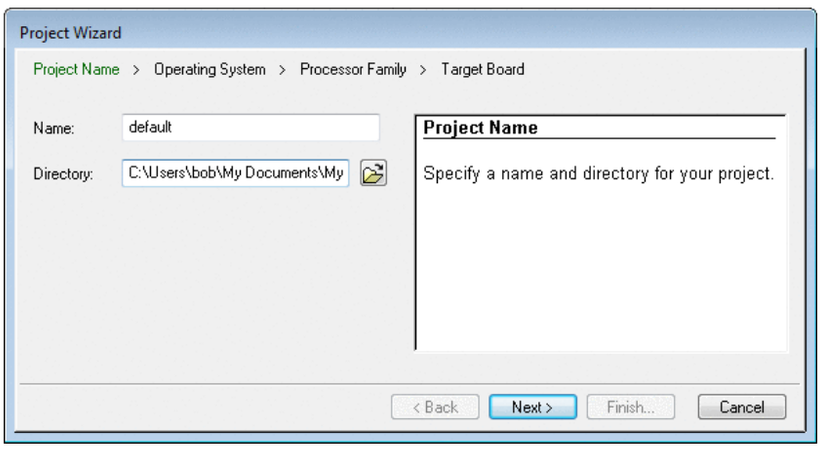
Creating a Top Project for Your Program

The **Project Wizard** is a tool that prompts you for information about your target board and creates a Top Project that contains:

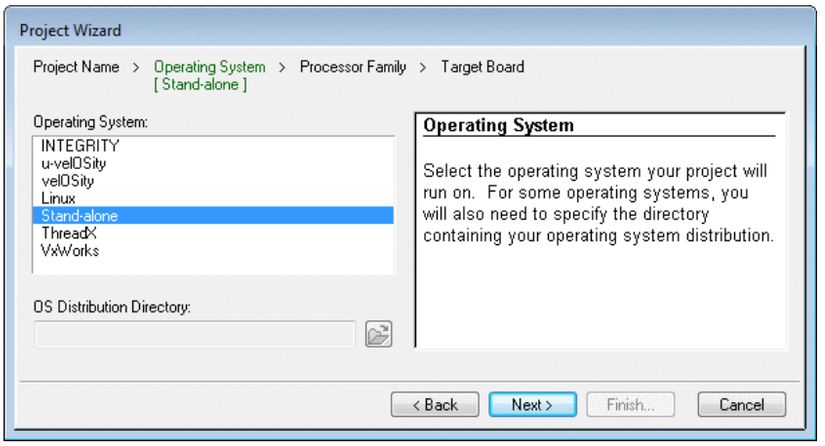
- Connection Methods that you use to connect to your target through your Green Hills Probe.
- A MULTI board setup (**.mbs**) script that configures your target.
- Linker directives files that define memory maps for your target.

To use the **Project Wizard** to create a **Top Project**:

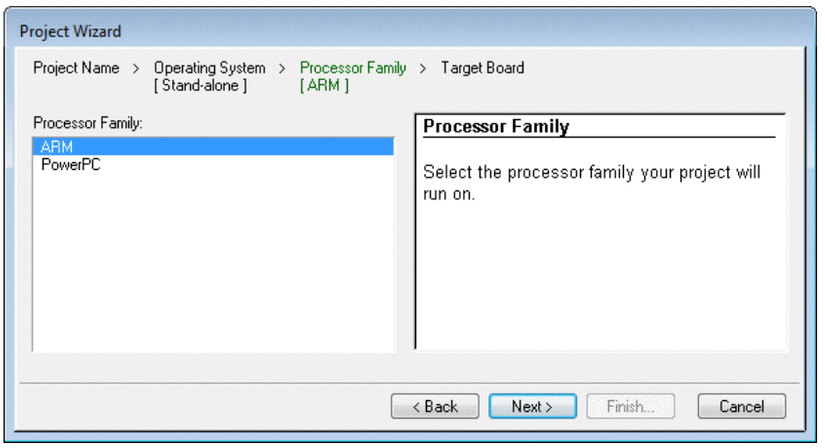
1. On your host machine, open MULTI.
2. From the MULTI Launcher, click  and select **Create Project** to open the **Project Wizard**.
3. Leave the default value in the **Name** box, and enter a directory for your Top Project in the **Directory** box. Click the **Next** button.



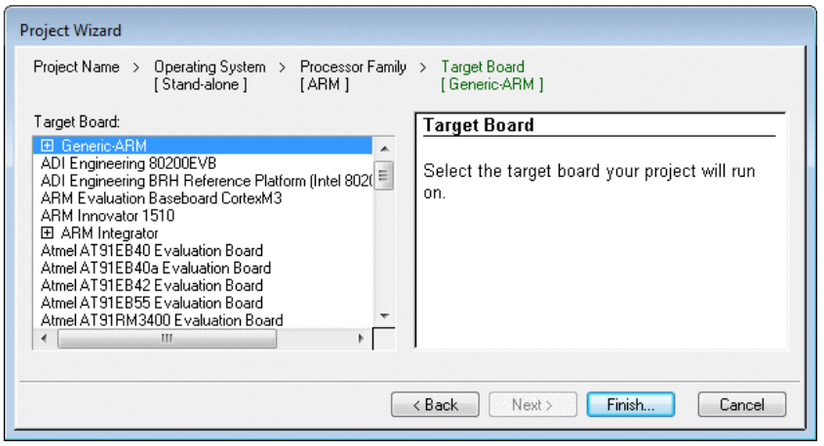
4. In the **Operating System** list, select **Stand-Alone**. Click the **Next** button.



5. In the **Processor Family** list, select the processor family to which your target's processor belongs. If you have only installed one processor family for MULTI, the wizard does not display this screen. Click the **Next** button.



6. In the **Target Board** list, select your target board. If your target board is not listed or you are using custom hardware, click the plus sign to the left of the **Generic** item at the top of the list and select your processor. In this case, you will probably need to customize the board setup script and linker directives files the wizard creates for your target. Click the **Finish** button to create your Top Project.



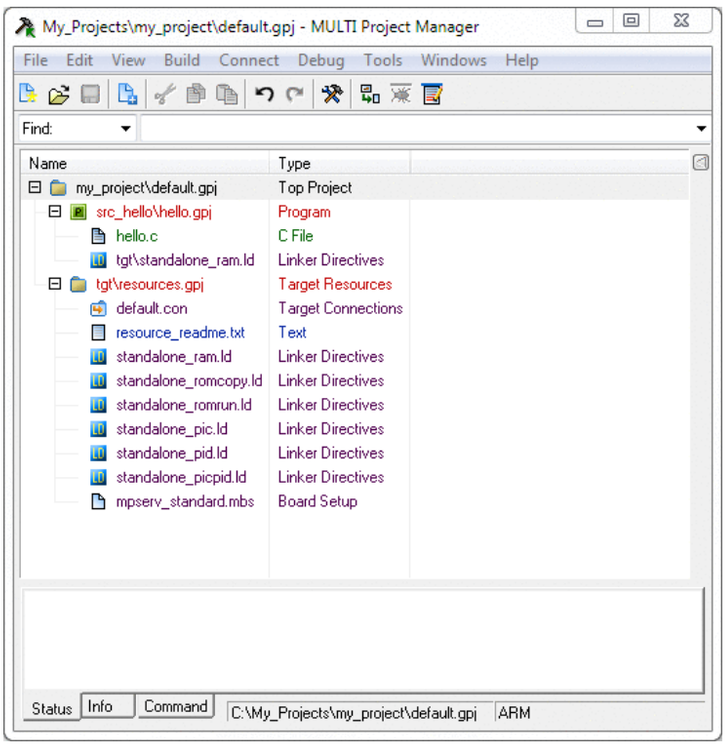
7. When the **Project Wizard** closes, a dialog box may open to inform you about the newly created Top Project. If so, click the **OK** button to continue.
8. After you create a new Top Project, the **Add Item to Project** dialog box opens. If you are creating a Stand-Alone project, select **Hello World (C)** and click the **Finish** button. This adds an example "Hello World" project to your Top Project.

You have now created a Top Project for your target.

For more information about **Project Wizard** screens and options, see the documentation about creating a new project in the *MULTI: Building Applications* book for your processor family.

Top Project Structure

After you create a Top Project, the MULTI Project Manager opens. It should look similar to the following window:



There are three projects in the window:

- ***dir*\default.gpj** — The Top Project.
- **src_hello\hello.gpj** — The example “Hello World” project you added with the **Add Item to Project** dialog box.
- **tgt\resources.gpj** — The *Target Resources project*. This project contains files necessary to configure and connect to your target (such as setup scripts and linker directives files).
    - **mpserv_standard.mbs** — The board setup script for your target. This script prepares your target for downloading and running a program. You may need to customize this script if you are using custom hardware.
    - ***name*.ld** — Linker directives files for your target. These files help determine how your program is laid out in memory. You may need to customize these files if you are using custom hardware.

In this example, the **src_hello\hello.gpj** project is linked using **standalone_ram.ld**. The **tgt\standalone_ram.ld** item in the **src_hello\hello.gpj** project represents the same file as the **standalone_ram.ld** item in the Target Resources project.

- **board_info.txt** (not available for all targets) — Additional notes about your target. If your project contains this file, read its contents before proceeding to the next section.

Building a Program from the Top Project

After you create a Top Project with the **Project Wizard**, you should test your debugging environment by downloading and running the example "Hello World" program. Before downloading the program, you must build your project.

To build the "Hello World" example project:

1. Select **src_hello\hello.gpj** in the Project Manager.
2. Click  .

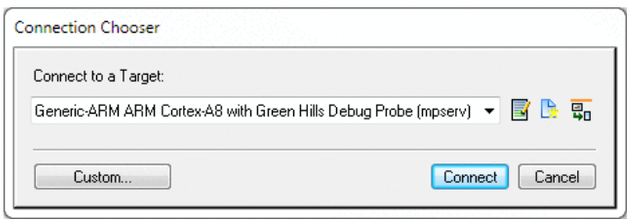
If the build was successful, you should see text similar to the following in the **Status** pane:

```
Building hello
Compiling hello.c because hello.o does not exist
Linking hello because it does not exist
Done
Build successful (Mon Jul 25 12:30:00 2011)
```

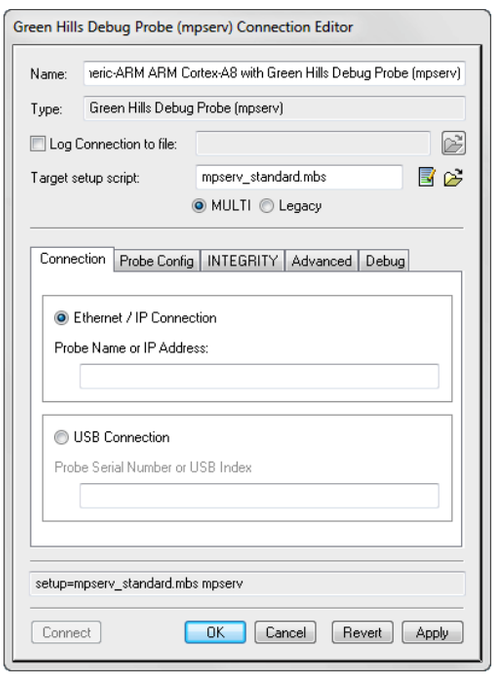
Connecting MULTI to Your Target

To connect MULTI to your target:

1. Verify that all hardware connections are tight and secure, and that both the board and your probe are powered.
2. In the Project Manager, select **src_hello\hello.gpj** and click to open the MULTI Debugger.
3. In the Debugger window, click to open a **Connection Chooser** window.
4. In the **Connect to a Target** list, select the **Green Hills Debug Probe (mpserv)** connection for your target. For example:



5. Click the **Connect** button. When the **Connection Chooser** prompts you to enter a Probe Name for the new connection, click **OK**. The **Connection Editor** window opens.



6. In the **Connection Editor** window:
    a. In the **Connection** tab, select the radio button that corresponds to your connection type (Ethernet or USB). If you connect to your probe over Ethernet, type the probe's hostname or IP address in the **Probe Name or IP Address** box. If you connect to multiple probes over USB, type the probe's serial number in the **Probe Serial Number or USB Index** box to specify which probe you want to connect to, and make sure that there are no active connections to that probe (such as the **Probe Administrator**).
    b. In the **Target Setup script** box, leave the default value (**mpserv_standard.mbs**). This file is the setup script that the **Project Wizard** generated and placed in your Target Resources project.
    c. Click **OK**.

The MULTI Debugger is now connected to your target.

For more information about the **Connection Editor**, see the documentation about the Connection Editor in the *MULTI: Configuring Connections* book.

Warning

Do not unplug the USB cable while MULTI is connected to your target over USB.

Downloading and Debugging a Program

To download and run the “Hello World” program:

1. In the MULTI Debugger, click  . The **Prepare Target** dialog box opens.
2. In the **Prepare Target** dialog box, leave the settings at their default values. The project is configured to download the program to RAM. Click **OK**.
3. The **Initializing Target** dialog box opens. This dialog box shows progress as MULTI runs your setup script and downloads the program. It closes when the progress is complete.

If the download and execution of the program are successful, your debugger should show output similar to the following:

```
I/O: Hello world.
I/O: ----------------------------
```

If the download was not successful, the **Prepare Target** dialog opens and displays any errors that occurred during the setup script or while downloading the program. If you are using custom hardware and have not modified the default setup script and/or linker directives files, you should expect some errors in red text in the **Prepare Target** dialog box.

If this happens, you must modify the default setup script and linker directives files in your Target Resources project to configure your target properly. For more information, see Chapter 2, “Configuring Target Resources” in the *Green Hills Debug Probes User's Guide*.

Appendix A

Troubleshooting

Contents

This section explains how to troubleshoot problems you may encounter when configuring your probe to detect and communicate with your target. Before looking at a specific topic, make sure that:

- Your target is powered on.
- Your probe is powered on.
- All connections are tight and secure.
- The supplied ribbon cable is plugged into your target in the proper orientation, in the correct port. Also, check that it is properly aligned (not shifted over by one pin).

Note

On shielded COP cables, the red stripe on the cable indicates pin 16, not pin 1.

If you have checked all the items in the previous list and are still having trouble setting up your Green Hills Probe, consult one of the following sections.

Setting Up Your Hardware

This section provides troubleshooting steps for initial probe setup.

- “The Supplied Ribbon Cable or Pod Does Not Fit in the Target's JTAG Header” on page 41
- “TraceEverywhere Target Adapter Status Light Is Red or Off” on page 41
- “The Probe Banner in the Serial Terminal Does Not Appear or Is Incomplete” on page 41
- “Corrupted Data is Printed to the Serial Terminal” on page 43
- “Cannot Type Commands Into the Serial Terminal” on page 43

The Supplied Ribbon Cable or Pod Does Not Fit in the Target's JTAG Header

If the supplied ribbon cable or pod does not fit in one of your target's JTAG ports:

- Do not attempt to physically modify the cable or pod.
- Some targets have more than one JTAG header. Look for a different JTAG header that fits.
- If your Green Hills Probe shipped with adapters for the ribbon cable or pod, try using one of them.

TraceEverywhere Target Adapter Status Light Is Red or Off

If you are using TraceEverywhere (TE) cabling, you have powered on your probe, and the TE target adapter's status light is red or turned off, there may be a problem with your connection. If this happens:

1. Turn your probe off.
2. Check to make sure all connections are tight and secure.
3. Turn your probe on, and enter the following command in a serial terminal:

   ```
   set adapter auto
   ```

4. Check the adapter setting to make sure it has changed to `auto`:

   ```
   set adapter
   ```

If the adapter setting is correct and the cables are secure, the status light should turn green. If the adapter type is `error` or the light does not turn green, there may be a problem with the TE target adapter. Contact Green Hills support.

The Probe Banner in the Serial Terminal Does Not Appear or Is Incomplete

When you boot your probe while connected to a serial terminal, if the complete probe banner does not display, try loading a new firmware

image (see “Recovering a Probe That Does Not Boot Properly” on page 57).

If the probe banner does not display at all, check to see if the power LED on the front of the probe is illuminated. If it is not illuminated:

- Verify that the power supply is connected to the probe, and that the power switch is in the on position.
- Turn the power switch off and then back on again.
- Try using a different power outlet and/or supply.

  If you have a beige probe, the power supply must have a voltage between 7 and 15 volts and provide at least 500mA of current. The polarity of the power supply (center-positive or outside-positive) does not matter.

  If you have a black probe, the power supply must have a voltage of 9 volts and provide at least 3A of current. The polarity must be center-positive.
- If the power LED still does not illuminate, contact Green Hills support.

If the power LED illuminates but no text appears in the serial terminal:

1. Turn the probe off.
2. Press and hold the **User** button on the front of the probe.
3. While holding the **User** button, turn the probe on.
   - If the probe does not print any text to the serial terminal, this indicates a problem with your cable or COM port. Try using a different COM port on your host computer, or a different null modem serial cable.
   - If the probe does print text to the serial terminal, try loading a new firmware image (see “Recovering a Probe That Does Not Boot Properly” on page 57).

Corrupted Data is Printed to the Serial Terminal

If your serial terminal emulator is displaying corrupted data when connected to the probe, your terminal's baud rate is probably incorrect.

The probe's serial port is configured at 9600 baud for a few seconds after it is power cycled, after which it changes to its configured baud rate setting. If the configured setting is not 9600 baud, the probe prints the following message in the terminal before changing the baud rate. For example, if the probe's baud rate is set to 38400, it would print the following message:

```
Switching baud rate to 38400, press the space bar to remain
at 9600.
```

If you need to change the rate back to 9600 baud:

1. Press the space bar when the probe prints this message.
2. After you are connected to the probe, type:

   ```
   set baud 9600
   ```

If you want to continue using the new baud rate (for example, 38400 baud), change the baud rate setting in your terminal program to 38400.

Cannot Type Commands Into the Serial Terminal

If you cannot type commands into the serial terminal:

- Make sure serial flow control is turned off in your serial terminal.
- Use a different null modem serial cable.

Note

Certain versions of the HyperTerminal application exhibit problems communicating with target systems in general. If you are experiencing problems, restart HyperTerminal. If this does not remedy the problem, try a different host machine, upgrade HyperTerminal, or switch to a different application.

Configuring Your Probe to Connect to MULTI

This section provides troubleshooting steps for configuring your probe to connect to your host machine.

Cannot Find Telnet On Windows Vista and Later

The Telnet application is not installed by default on Windows Vista and later systems. To install the Telnet application:

1. Click the **Start** button and click **Control Panel**.
   - If your control panel has the normal view:
     a. Click **Programs**.
     b. In the **Programs and Features** group, click Turn **Windows Features On or Off**.
   - If your control panel has the classic view:
     a. Click **Programs and Features**.
     b. Click **Turn Windows Features On or Off**.
2. Select the **Telnet Client** check box and click **OK**.

Cannot Connect to Probe Over Telnet

If you cannot connect to your Green Hills Probe over Telnet, your Ethernet settings are probably incorrect. The easiest way to determine if your probe Ethernet settings are correct is to ping it from your host machine. To ping your probe, from a command prompt, type:

```
$ ping hostname
```

where *hostname* is your probe's hostname, or

```
$ ping ip_address
```

where *ip_address* is your probe's IP address.

If **ping** is successful, it prints a report similar to the following:

```
$ ping ghprobe11111

    Pinging ghprobe11111.ghs.com [192.168.100.111] with 32 bytes of data:

    Reply from 192.168.100.111: bytes=32 time<10ms TTL=29
    Reply from 192.168.100.111: bytes=32 time=10ms TTL=29
    Reply from 192.168.100.111: bytes=32 time<10ms TTL=29
    Reply from 192.168.100.111: bytes=32 time<10ms TTL=29

    Ping statistics for 192.168.100.111:
        Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
       Minimum = 0ms, Maximum =  10ms, Average =  2ms
```

If **ping** is unsuccessful, it prints a report similar to the following:

```
$ ping ghprobe11111

    Pinging ghprobe11111.ghs.com [192.168.100.111] with 32 bytes of data:

    Request timed out.
    Request timed out.
    Request timed out.
    Request timed out.

    Ping statistics for 192.168.100.111:
        Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum =  0ms, Average =  0ms
```

- If **ping** is unsuccessful, verify that an Ethernet cable is plugged in and that the green connection light in the upper-right corner of the probe's Ethernet port is illuminated.
  - If it is illuminated, watch the light in the upper-left corner of the Ethernet port. On beige probes this light is orange, and on black probes it is green. If the light on the left is not flashing periodically, you may need to reconfigure your IP address, netmask, and/or gateway (see “Connecting to Your Probe Over Ethernet” on page 18 for instructions).
  - If it is not illuminated, try a different cable or connect to a different port on your hub or switch.

- If **ping** is successful but you cannot connect to the probe over Telnet, unplug the Ethernet cable from the probe and ping it again, with the cable unattached.
  - If **ping** is still successful, another device on your network probably has the same hostname or IP address as your probe. Obtain a unique address and hostname from your network administrator and reconfigure the probe (see "Connecting to Your Probe Over Ethernet" on page 18 for instructions).
  - If **ping** is no longer successful, or if you have a unique IP address and still have problems, open a Telnet connection from a different host machine. If the problem still persists, contact Green Hills technical support.

Cannot Connect to Probe Over USB

USB is only supported on Windows.

Only one software program can connect to a probe over USB at a time. If you have connected to the probe over USB before, but now are unable to, check that there are no other active USB connections to the probe, such as **mpadmin**, **gpadmin**, **mpserv**, or the **Probe Administrator**. If there are, close them.

The USB link LED should illuminate when the host machine and the probe have both been booted. If this does not happen:

1. Check that you have properly installed the USB cable between your host machine and the probe.
2. If the previous steps do not solve the problem, unplug the USB cable from the probe and plug it back in again.
3. If the LED still does not illuminate, unplug the USB cable from the probe, re-install the drivers by running the installation application **setup.exe**, and then reattach the USB cable.
4. If the problem persists, contact Green Hills technical support.

Windows is Unable to Start Probe as a USB Device

On some hosts, Windows may report that it is unable to start your device (with error 10) the first time you plug in a probe to the USB port. If this happens, unplug the USB cable and plug it back in. Windows should now be able to start it as a USB device.

Configuring Your Probe for Your Target

This section provides troubleshooting steps for configuring your probe to connect to your target, detect its processors, and read registers. To follow the instructions in this section, your probe must be connected to your target, and your host must be connected to the probe over the serial port. For instructions that explain how to connect to your probe, see “Connecting Your Host to Your Probe Over the Serial Port” on page 14.

If the troubleshooting steps in this section do not address your problem, your target may require extra configuration. For more information, see “Usage Notes” in Appendix D, “Troubleshooting and Usage Notes” in the *Green Hills Debug Probes User's Guide*.

detect Issues Error 60

If the **detect** command returns the following:

```
ERROR 60: Target power off
```

1. Check to make sure that your target's power is turned on and your connections are tightly seated.

2. If your target's power is on, the probe's logic high level may be configured too low or too high for your target. See “Configuring the Probe's Logic High Level” on page 56.
3. After configuring the logic high level, run **detect** again.

detect Does Not Display a Processor Table

If the **detect** command does not display a processor table, but returns output similar to the following:

```
ERROR 1 (general error): Unable to detect target. (jtag_ir_length=0; TDO
held low?) Please use the "set target" command to configure manually.
ERROR 1 (general error): Timeout while trying to determine number
of cores.
```

The logic high level of the probe may be set incorrectly for your target. See “Configuring the Probe's Logic High Level” on page 56.

If the **detect** command continues to fail, there may be a low-level JTAG connection problem. See “Diagnosing Low-Level JTAG Connection Problems” on page 54.

detect Issues Error 71

If the **detect** command returns the following:

```
ERROR 71: probe output pins are disabled
```

look at the LEDs on the front of the probe on the right side. If they are blinking:

1. In a serial terminal, type `jp on` or press the **User** button on the front of your probe.
2. If the LEDs stop blinking, run **detect** again.

detect Sets the Target Processors and then Issues an Error

If the **detect** command is able to set your target string but then returns an error, it is likely that the probe cannot reset the target. For more information, see “tr Does Not Reset the Target” on page 52.

detect Sets the Target Processor to other

If the **detect** command sets your target string to `other`, enter the following command in the serial terminal:

```
set target ?
```

Look for your processor in the resulting list. If your processor is listed:

1. Configure the probe's target setting manually with the following command:

   `set target` *`target_string`*

   where *target_string* is the string listed for your processor.
2. Configure the probe's endianness setting:

   `set endianness` *`mode`*

   where *mode* is either `big` or `little`.

If your processor is not listed, it may not be supported. Contact your Green Hills sales representative for more information.

detect Lists Devices Connected to the Probe, but Sets the Target Type to other

If the **detect** command lists devices connected to the Probe, but sets the target type to `other`, it may be accompanied by one of the following messages:

```
* - Indicates a core that requires a Probe feature key to debug.
```

If you receive this message, it indicates that you are connected to a target that is not supported by the default Probe configuration. Access to the debug features of this core may be enabled with a feature key (generally available through an early access agreement or a specific license agreement). If you have received a feature key, install the key, reboot your Probe, and try again. If you are entitled to a key but do not have one, contact Green Hills support.

```
+ - Indicates a core whose detected jtag idcode is known to be shared
by many cores, and detect failed to distinguish among them.
```

If you receive this message, it indicates that you are connected to a target that shares an `idcode` with several other devices, and the Probe could not determine which one you have. In this case, there are two possibilities:

- Your target is supported, but you need to specify it manually using the **set target** command.
- Your target is not supported, in which case you can contact your sales team to learn when the device will be supported.

detect Sets the Target Processor Incorrectly

Because multiple processors within the same family sometimes have the same `PVR` or `idcode`, **detect** might not set the target to the correct processor. If this happens, set your target processor manually using the instructions in “detect Sets the Target Processor to other” on page 50.

detect Passes but vb Fails

PowerPC 5xx, PowerPC 8xx, and ColdFire targets do not support the **vb** command. Do not use this command if you have one of these targets. If your target does support the **vb** command, but it fails, the error message should look similar to:

```
ERROR 13 (test failed): Test failed: in=input, out=output,
i=iter
```

If you receive this error:

1. The JTAG clock may be set too fast. The probe **detect** command uses a clock setting of 10kHz, while the default clock setting is 10MHz. Set the clock to 1MHz by typing the following command in the serial terminal:

   ```
   set clock 1MHz
   ```

   If **vb** works after you decrease the clock speed, you can try increasing it slowly to find higher speeds that still work reliably. If 1MHz does not work, try clock settings that are between 10kHz and 1MHz.

2. You may need to set the probe's logic high level. See “Configuring the Probe's Logic High Level” on page 56.
3. If **vb** continues to fail after you have configured the probe's clock speed and high logic level, your target processor may have been set incorrectly. For information about solving this problem, see “detect Sets the Target Processor Incorrectly” on page 51.

tr Does Not Reset the Target

If your target does not reset when you enter the **tr** command, the JTAG clock speed might not be set correctly. To adjust the clock speed:

1. In a serial terminal, type `set clock 1MHz` to set the clock speed to 1MHz.
2. Type `tr` to reset your target.

If **tr** still does not reset your target:

- The nHRESET and nTRST lines may be tied together. For more information, see “Diagnosing JTAG TAP and CPU Reset Line Problems” in Appendix D, “Troubleshooting and Usage Notes” in the *Green Hills Debug Probes User's Guide*.
- The JTAG reset pin may be connected to an open-drain connection, meaning that your target must have a pull-up resistor in order to drive it HIGH. For more information, see “Diagnosing Low-Level JTAG Connection Problems” on page 54. If your target does have a pull-up resistor and your probe has a serial number less than 2500, try increasing the strength of the pull-up on reset.

vr Fails or Issues Error 18

If **vb** passes, but **vr** fails or returns an error such as:

```
ERROR 18: the target is not stopped
```

the JTAG clock speed may be set too high. To fix this problem:

1. In a serial terminal, type the following command to lower the clock speed:

   ```
   set clock 1MHz
   ```

2. Type `vb` to confirm that you can communicate with the target. If you are using a BDM target, type `tr` instead of `vb`.
3. Type `vr 100` to perform the register test again.

General Configuration Instructions

While the previous sections explained how to fix specific problems that you may encounter while configuring your probe, this section explains how to troubleshoot probe problems that are more general in nature.

Diagnosing Low-Level JTAG Connection Problems

Use the **vta** command to troubleshoot low-level JTAG connection problems. **vta** verifies that the probe can individually control each pin on the target by individually setting each pin HIGH and LOW, checking for shorts, opens, and stuck-at conditions. For example, **vta** can detect if the TCK pin is shorted to GND, or if the TMS pin is not making contact with the probe.

To run this test:

1. If you are using legacy cabling, unplug the ribbon cable or pod from your target in case there is a shorted pin or other problem that could cause damage. If you are using TraceEverywhere (TE), unplug the target adapter from your target.
2. In the serial terminal, type `vta`.

The results of a successful test look similar to the following output (only a few lines are shown here):

```
>vta
Testing arm-20 adapter pins:
                      VTREF passed. [100%]
                    VSUPPLY passed. [100%]
                      NTRST passed. [100%]
                        GND passed. [100%]
                        TDI passed. [100%]
                        GND passed. [100%]
                        TMS passed. [100%]
```

If a pin has a connection problem, the probe issues an error. For example, if the probe could not bring `TDO` low, it would print:

```
TDO was not initially low.
```

If you are using legacy cabling, check that target adapter type shown in the results correctly matches the adapter on the probe's front panel. If this test fails and the adapter type is correct, there may be a problem with the adapter on the probe. In this situation:

- If you are using legacy cabling, repeat the test with the ribbon cable unplugged from the adapter.
- Verify that the adapter is plugged in securely, and the screws are snug.
- Remove the adapter, inspect it for damage or contaminants, re-install it, and repeat the test.

If the test still fails, the probe or target adapter may be damaged. In this situation:

- Try a different target adapter
- If you are using legacy cabling, try a different cable. If using an active COP pod, try a passive COP cable or a shielded COP cable.
- Contact Green Hills technical support.

Note

Some JTAG pins controlled by the probe (for example, reset lines) are connected to open-drain connections with more than one driver, meaning that the probe cannot drive them HIGH. When you run **vta** with your target unplugged, it issues the following message for each of these pins, because there is no pull-up resistor on the target adapter to bring the signal HIGH:

```
PIN could not be brought high.
```

If *PIN* is connected to an open-drain connection, this does not necessarily mean that there is a problem with the adapter, but it indicates that there should be a pull-up resistor on the target board for this pin.

Configuring the Probe's Logic High Level

To configure the logic high level for your probe:

- For TraceEverywhere and HSST connections, type `dlh` in a serial terminal to detect the correct logic high level for your target.

To set the logic high level manually:

1. Consult your target's reference manual to confirm its logic high level.
2. Type the following command in the serial terminal:

   `set logic_high` *`level`*

   where *level* is the logic high level for your target. To confirm that the probe has updated this setting, type:

   ```
   set logic_high
   ```

If your adapter does not support logic high level detection, you may see the following error message:

```
This adapter does not support logic_high detection.
```

If this is the case:

1. Set the logic high level manually.
2. Type the following command to disable power detection:

   ```
   set power_detect off
   ```

3. After disabling power detection, before turning your target's power on or off, type the following command to tri-state the probe:

   ```
   jp off
   ```

   After your target is on, type:

   ```
   jp on
   ```

   Perform this step each time you turn your target on.

Recovering a Probe That Does Not Boot Properly

If your probe is not booting properly, you can recover it using the serial port with the instructions below:

1. Turn your probe off.
2. On your host machine, run MULTI. In the MULTI Launcher, select **Utilities → Probe Administrator**.
3. In the **Probe Administrator** window, select **Probe → Recover Probe**. A dialog box opens to confirm that you want to update your firmware. Click **OK**.
4. The **Update Probe Firmware** window opens. Enter the full path to a firmware file in the **Firmware File** box, or click the  button and select it in the file chooser. Click the **Flash Probe** button.
5. The **Serial Boot** dialog box opens. If the correct serial port is not already displayed, type the name of the serial port to which your probe is connected. Click **OK**.
6. A dialog box opens. Turn your probe on while holding down the **User** button (as instructed by the dialog). After turning on your probe, click the **OK** button.
7. The **Reloading Probe Firmware** dialog box opens and displays the status of the update. When it is finished, click **Done**.
8. Power cycle your probe. The new firmware is now loaded and running.

Note

For information about updating probe firmware, see “Updating Probe Firmware” in Chapter 1, “Administering Your Probe” in *Green Hills Debug Probes User's Guide*.

Uninstalling Probe Software

To uninstall probe software on Linux/Solaris, follow the instructions for using **gpatch** located at ***install_dir*/restore/readme.txt**.

To uninstall probe software on Windows, use the **Add/Remove Programs** feature in your version of Windows.

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